The Great Dismal Swamp Health and Air Quality

by

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STOCK FOOTAGE OF NASA LOGO.

STOCK FOOTAGE OF NASA EARTH SCIENCE LOGO.

SHOT – FULL PAN

Pan across team picture with name captions under each member.

SHOT – FULL PAN

Pan across the Great Dismal Swamp with text using 3D Camera Tracker from Adobe After Effects CS6.

ROYALTY FREE MUSIC.

Broke For Free – Something Elated

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EXT. SCENE. DAY – THE GREAT DISMAL SWAMP NATIONAL WILDLIFE REFUGE.

JUSTIN WEISER of NASA's DEVELOP LaRC Program squats in front of Lake Drummond at the Great Dismal Swamp National Wildlife Refuge in Virginia. He is dressed in casual clothing, smiling at the camera. Google Earth tour fly-in is overlaid. DEVELOP and NASA logos are located on top left and right corners respectively. Title includes name and education.

SHOT – FULL

                    JUSTIN W.

          This summer the Dismal Swamp Health and Air Quality
          team is working to assess air quality and public
          health risks associated with the Great Dismal Swamp
          Lateral West Fire of 2011.

SHOT – FULL

DANIELLE MALLON of NASA's DEVELOP LaRC Program stands in front of burned area at the Great Dismal Swamp National Wildlife Refuge in Virginia. Lightning video effect from Adobe Premiere

Pro CS6 is used. Stock footage of fire and smoke plume are used. DEVELOP and NASA logos are located on top left and right corners respectively. Title includes name and education.

                    DANIELLE

        In August of 2011, lightning strikes in the Great
        Dismal Swamp sparked fires that raged for three and a
        half months until late November. Wildfires are an
        expected annual event in the Great Dismal Swamp, but
        this particular fire was exacerbated by a substantial
        drought being felt by the region prior to that August.
        The Lateral West fire which burned 6500 acres, raised
        concern for air quality when smoke from the fire
        reached as far north as Washington D.C.

SHOT – PPT SLIDE #1

PPT of Project Objectives.

                    JUSTIN W. (VOICE OVER)

        Based on the needs of our partners and community
        concerns, the DEVELOP students at LaRC established the
        following objectives. We wanted to provide partners
        with a methodology utilizing NASA EOS to improve
        understanding of wildfire emission impacts on local
        health and respiratory illness. Wildfires, according
        to the VA DEQ, fall within the Environmental
        Protection Agency established Exceptional Events Rule
        and affect daily air quality readings which may exceed
        the EPA's National Ambient Air Quality standards. The
        use of NASA EOS will aid in their planning
        requirements, including examining baseline emission
        levels to determine necessary control strategies. In
        correspondence with the EPA, TNC is conducting an
        analysis on the health impacts resulting from the 2011
        fire. These findings combined with our methodology
        will provide more accurate air quality warnings in an
        effort to create public risk thresholds for future
        wildfire events.

SHOT - PPT SLIDE #2

PPT of Project Methodology.

                    VIVEK (VOICE OVER)

        To accomplish our objectives, we established a
        methodology analyzing smoke plumes and air quality
        changes. To assess burn extent and severity we used
        LANDSAT 5 thematic mapper to make Difference
        Normalized Burn Ratios measuring burn scars, and
        validated our findings with Aqua MODIS Daily Fire
        Detection Product. We used Terra MODIS to determine
        aerosol optical thickness. CALIPSO and NASA LaRC High
        Spectral Resolution LiDAR were used to assess aerosol
        distribution and concentration. Lastly, we used
        HYSPLIT trajectories and concentration models to
        identify the origins of smoke-borne pollutants.

SHOT - PPT SLIDE #3

PPT of Ground Monitoring Data and Health Records.

                    CHELIENE (VOICE OVER)

        The NAAQS primary standard is set to 35 µg/m^3 with an
        averaging time of 24 hrs. Peaks seen during August 5
        through August 25 at Hampton, Norfolk, and Virginia
        Beach ground sensors, as measured by the Virginia DEQ,
        correlate with the peaks observed in the Emergency
        Department Respiratory Patients on August 9 and 10 as
        well as August 20 and 21 as recorded by Sentara and
        Albermarle hospitals. During these dates, the number
        of patients increased by an average of 150%. MODIS
        fire mapper points indicated between those days show
        the fire spreading rapidly.

SHOT - PPT SLIDE #4

PPT of LaRC's High Spectral Resolution LiDAR Program.

                    JUSTIN P. (VOICE OVER)

        To better understand the effects of meteorology on the
        spread of aerosols, HYSPLIT back trajectories were

used along with HSR-LiDAR data from August 24th. The backscatter data measures the concentration of aerosols displaced into the atmosphere and was used along with back trajectories at multiple altitudes. This provides more detailed information on the transport and concentration of particles at various elevations. The passage of low-level trajectories over the Dismal Swamp seems to evidence particle origin from the Lateral West fire.

SHOT – PPT SLIDE #5

PPT of CO Concentration and AOD Using AIRS and MODIS.

                    VIVEK (VOICE OVER)

A comparison of Carbon Monoxide concentration to aerosol optical depth was performed using Aqua AIRS and Terra MODIS. These images show daily concentration and direction of carbon monoxide and AOD during the month of August. Both variables are characteristics that are strongly associated with smoke plumes and suggest that the fire is responsible for the degradation of air quality in the higher concentration areas circled in black.

SHOT – PPT SLIDE #6

PPT of Effects of Smoke Plumes on Aerosol Content.

                    ADDIE (VOICE OVER)

In these images, the areas affected by smoke plume dispersion, as identified by the HYSPLIT Frequency model, are overlaid with MODIS AOD and CALIPSO 532nm backscatter. It is interesting to note that, as would be expected, the HYSPLIT trajectories intersect the MODIS and CALIPSO data where they indicate greater aerosol activity. This finding would appear to indicate that smoke from the Lateral West fire was indeed responsible for the spike in PM2.5 readings seen by the Virginia DEQ's ambient air ground stations.

SHOT – PPT SLIDE #7

PPT of Estimated PM Concentration of Smoke Plumes Using NOAA
HYSPLIT Dispersion Model with CALIPSO.

                    ADDIE (VOICE OVER)

        This image illustrates estimated smoke plume
        particulate matter concentration derived from NOAA's
        HYSPLIT Dispersion Model overlaid with CALIPSO
        backscatter data from August 17th. HYSPLIT's indication
        of high levels of low altitude particulate
        matter visually correlated well with CALIPSO's high
        concentrations within the planetary boundary layer. A
        back trajectory was run from 1000 meters, which is
        near the top of the PBL, in order to determine the
        particles' origin. The trajectory clearly passes over
        an area of multiple power plants northwest of the
        fire, their PM2.5 emissions represented by graduated
        symbols. This demonstrates the presence of point
        source pollution in our study area in addition to the
        fire, that would most likely be in the area if the
        fire was not present.

EXT. SCENE. DAY – JET STATUE.

JOHN MAYER of NASA's DEVELOP LaRC Program stands in front of a
jet statue, with state flags blowing in the background. He is
wearing business casual clothing. Stock footage of rear thruster
is used. DEVELOP and NASA logos are located on top left and
right corners respectively. Title includes name and education.

SHOT – MEDIUM DOLLY

                    JOHN

        Amongst our conclusions, we saw that a greater
        utilization of NASA's Earth Observation Systems would
        assist our partner programs in their analysis of
        wildfire events. We also saw that our particular
        project offered a unique opportunity to help Langley
        HSRL program in their analysis of aerosol type and
        concentration. Finally, we saw a spike in hospital

admissions for respiratory patients that coincided
with an increase in fire intensity and severity.

EXT. SCENE. DAY – THE GREAT DISMAL SWAMP NATIONAL WILDLIFE
REFUGE SIGN.

TAYLOR BEARD of NASA's DEVELOP LaRC Program stands in front of
the Great Dismal Swamp National Wildfire Refuge sign. She is
wearing casual clothing. DEVELOP and NASA logos are located on
top left and right corners respectively. Title includes name and
education.

SHOT – FULL

                    TAYLOR

          At the end of this term, we will be proudly handing
          over our methodologies and end products to the
          Virginia Department of Environmental Quality, The
          Nature Conservancy, and the Great Dismal Swamp
          National Wildlife Refuge managers to improve
          understanding of emission impacts on local health
          during future wildfire seasons.